Changes to the Drawings

The attached sheets of drawings include a prior art legend on each of FIGS. 1a-2a, as required in the Office action. Additionally, reference numerals 9 and 10 have been added to FIGS. 2a-2d to call out a CMOS image sensor and an epitaxial wafer, respectively. It is respectfully submitted that these drawing changes do not introduce new matter and eliminate any objections that may have been proper.

As a further note, the applicants note that FIG. 1b was published with the pre-grant publication. It is respectfully requested that FIG. 2d be published on the cover page of any patent that is to issue from this application.

Remarks

In the Office action, claims 1-6 were rejected as being unpatentable over Applicants' admitted prior in view of Yaung (US 6,372,603). The drawings and the claims were also rejected for formal matters.

Claims 1-6 are pending and at issue. By way of the foregoing amendment claim 1 has been amended for clarity. In view of the foregoing amendments and the following remarks, reconsideration of the application is respectfully requested.

As addressed above, replacement drawing sheets including reference numerals 9 and 10 and prior art legends on various figures have been submitted. Additionally, the specification has been amended to include reference numerals 9 and 10. It is respectfully submitted that the addition of the reference numerals to the drawings and the specification do not constitute new matter because the numerals merely clarify words and features in the originally filed specification and drawings. Withdrawal of the objections to the drawings is respectfully requested.

With regard to the objection to claim 1, it is respectfully submitted that the foregoing amendments alleviate any unclarity that may have existed. In particular, amended claim 1 makes it clear that the epitaxial layer is being etched to form the shallow trench. Further, amended claim 1 makes it clear that it is the photoresist layer is being patterned. Withdrawal of the objection to claim 1 is respectfully requested.

The Rejections Under 35 U.S.C. § 103

Independent claim 1 recites, *inter alia*, forming a CMOS image sensor on an epitaxial wafer including an epitaxial layer positioned on a substrate. Claim 1 further recites that a photoresist layer is patterned and that the epitaxial layer is etched to form a shallow trench on a pixel area. A photodiode junction is also formed in at least a portion of the shallow trench of the pixel area by patterning, ion implantation, and thermal treatment. Advantageously, the foregoing process results in a shallow trench in the pixel area, thereby increasing the effective area of the pixel because the sidewalls of the trench are included in the pixel area.

In rejecting claim 1, the Office action applies the Applicants' admitted prior art in combination with Yaung. In particular, the Office action contends that the admitted prior art

discloses forming a CMOS image sensor, wherein the method includes, "forming shallow trench isolation (3) prior to forming the first resist layer ..." The Office action concedes, however, that the admitted prior art does not disclose "forming a second photoresist layer over said structure, patterning so as to form a photodiode junction, and, then, conducting ion-implanting process; and removing said second photoresist layer and conducting a thermal treatment process" and looks to Yaung to cure this admitted deficiency.

It is respectfully submitted that the claims as amended are allowable over the combination of the admitted prior art and Yaung, even if there were motivation for the proposed combination (which is a point that is not conceded). In particular, as noted above, the claims now recite that the epitaxial layer is etched to form a shallow trench on a pixel area, wherein a photodiode junction is subsequently formed in at least a portion of the shallow trench of the pixel area. This is different from the admitted prior art and Yaung, either separately or in combination with one another.

The admitted prior art discloses that STI structures are used to isolate pixels from one another. (See [0005]). However, the admitted prior art does not disclose or suggest etching the epitaxial layer to create a trench in the pixel area or that a photodiode should be formed in at least a portion of the shallow trench of the pixel area. To the contrary, the admitted prior art discloses that the STI structures should be masked to avoid any contamination thereof and should not, therefore, form part of the pixel area. (See FIG 1b).

Yaung is directed to a photodiode with a tightly controlled junction profile. Yaung discloses trench formation in a substrate and that an N-well should be formed at the bottom of the trench. (See FIG. 2E). However, it is respectfully submitted that Yaung does not disclose or suggest forming a shallow trench in an epitaxial layer to create a trench in a pixel area that will be patterned to form a photodiode junction. In fact, it is believed that the word epitaxial does not even appear in Yaung.

Neither the admitted prior art nor Yaung discloses or suggests etching an epitaxial layer to form a shallow trench in a pixel area or that a photodiode should be formed in at least a portion of the shallow trench. Accordingly, it follows that no combination of these references can render the pending claims obvious. Allowance of claim 1 and all claims dependent thereon is respectfully requested.

Reconsideration of the application and allowance thereof are respectfully requested. If there is any matter that the examiner would like to discuss, the examiner is invited to contact the undersigned representative at the telephone number set forth below.

Respectfully submitted,

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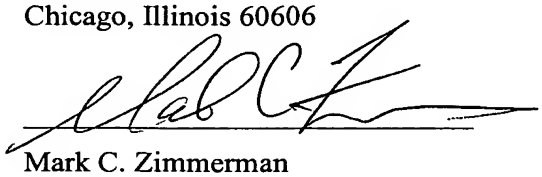

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